

What is claimed is:

1. A valve actuator for moving a valve gate between open and closed valve positions within a valve body, said valve actuator comprising:

- an operator housing defining a pressure chamber therein and having a fluid entry port;

- an operator member within said operator housing movable in response to pressurized fluid introduced into said operator housing pressure chamber through said fluid entry port;

- a bonnet housing securable to said valve body, said bonnet housing having a bonnet housing bore therethrough;

- a bonnet stem axially moveable in said bonnet housing bore and securable to said valve gate for moving said valve gate to said open and closed valve positions, said bonnet stem being axially movable in response to movement of said operator member with respect to said valve body;

- a downstop member rotatably and axially affixed to said bonnet stem for stopping axial movement of said bonnet stem with respect to said valve body;

- a stop surface fixably positioned with respect to said bonnet housing;

- one or more bonnet stem spacers disposed on said stop surface and engageable by said downstop member to stop axial movement of said bonnet stem with respect to said valve body for a selected bonnet stem drift;

- a biasing member for producing a biasing force opposing axial movement of said operator member toward said valve body; and

- a base ring connected to said bonnet housing in surrounding relationship therewith for securing said operator housing to said bonnet housing, said operator housing and said operator member being removable from said base ring without affecting said selected bonnet stem drift.

2. The apparatus of Claim 1, further comprising:

- a flexible diaphragm mounted within said operator housing for applying pressure against said operator member, said flexible diaphragm having an engagement side that engages said operator member and a face side opposite said engagement side;

- a metallic insert disposed on said face side of said flexible diaphragm; and

- an elastomeric face seal for engaging said metallic insert.

3. The apparatus of Claim 2, further comprising:

a diaphragm retainer nut for retaining said flexible diaphragm in a fixed position with respect to said operator member, said diaphragm retainer nut having a circular groove disposed therein for receiving said elastomeric face seal.

4. The apparatus of Claim 1, wherein:

said base ring is configured for rotation with respect to said bonnet housing without affecting said selected bonnet stem drift for permitting said fluid port to be selectively rotated with respect to said bonnet housing.

5. The apparatus of Claim 1, further comprising:

a top shaft extending from said operator housing, said top shaft being axially movable through said top shaft aperture and within said pressure chamber, said top shaft being sealingly rotatable with respect to said operator housing and rotatable with respect to said bonnet stem.

6. The apparatus of Claim 5, further comprising:

non-metallic bearings for supporting said top shaft to avoid metal-to-metal contact during axial movement of said top shaft.

7. The apparatus of Claim 5, further comprising:

a seal cartridge disposed within said top shaft aperture of said operator housing, said seal cartridge having a top shaft bore therethrough with a seal therein for sealingly engaging said top shaft, said seal cartridge having an outer surface with a seal thereon for sealingly engaging said top shaft aperture; and

a retainer ring for retaining said seal cartridge within said top shaft aperture, said retainer ring and said seal cartridge being removable from said top shaft aperture without removing said operator housing from said bonnet housing.

8. The apparatus of Claim 7, wherein:

said seal cartridge is comprised of a non-metallic material.

9. The apparatus of Claim 1, further comprising:

a bonnet ring threadably secured to said bonnet housing, said stop surface being formed on an outer end of said bonnet ring; and

a lock member for rotatably and axially securing said bonnet ring to said bonnet housing to prevent a change in said selected bonnet stem drift.

10. The apparatus of Claim 9, further comprising:

a seal cartridge secured within said bonnet housing bore by said bonnet ring, said seal cartridge having an inner seal for engaging said bonnet stem and an outer seal for engaging said bonnet housing bore, said seal cartridge having a non-metallic wear bearing for supporting said bonnet stem.

11. The apparatus of Claim 1, further comprising:

a top plug secured to said operator housing and having a bore therethrough, said top plug having a threaded exterior surface;

a top shaft extendable through said top plug and into said pressure chamber, said top shaft being movable axially to apply force to said bonnet stem; and

a second operator secured to said top plug, said second operator having an operator member for applying force to said top shaft.

12. A valve actuator for moving a valve gate between open and closed valve positions with a valve body, said valve actuator comprising:

a first operator housing including a pressure chamber, a housing bore, and a fluid entry port;

a first operator member within said first operator housing movable in response to introduction of fluid into said operator housing pressure chamber through said fluid entry port;

a bonnet housing securable to said valve body, said bonnet housing having a bonnet housing bore therethrough;

a bonnet stem axially moveable in said bonnet housing bore and securable to said valve gate for moving said valve gate to said open and closed valve position, said bonnet stem being axially movable in response to movement of said first operator member with respect to said valve body;

a downstop member rotatably and axially affixed to said bonnet stem for stopping axial movement of said bonnet stem with respect to said valve body;

a top stem extending from and axially movable within said first operator housing, said top stem being rotatable with respect to said bonnet stem and said downstop member, said bonnet stem being axially moveable in response to axial movement of said top stem with respect to said valve body;

a top stem seal cartridge removably disposed within said first operator housing bore, said top seal cartridge having a top stem seal and an operator bore seal;

a cartridge securing member to secure said top stem seal cartridge within said first operator housing bore, said cartridge securing member and said top stem seal cartridge being removable from an exterior surface of said operator housing;

a stop surface fixably positioned with respect to said bonnet housing;

a biasing member for producing a biasing force in a direction away from said valve body to oppose movement of said operator member in a direction toward said valve body; and

a base ring connected to said bonnet housing in surrounding relationship therewith for securing said first operator housing to said bonnet housing.

13. The apparatus of Claim 12, further comprising:

a second actuator housing threadably secured to said first operator housing; and

a second operator member being operable to apply force to said top stem for moving said bonnet stem.

14. The apparatus of Claim 13, further comprising:

first and second diaphragms for applying force to a plate portion of each of said respective first and second operator members.

15. The apparatus of Claim 12, wherein:

said first actuator member is a hydraulically driven piston.

16. A method of opening and closing a valve comprising the steps of:
fixably securing a downstop member to a bonnet stem;
adjusting a bonnet stem drift with one or more stem spacers carried by a bonnet housing;
applying pressurized fluid to a operator housing;
moving said downstop member and the bonnet stem axially towards said valve in response to said step of applying pressurized fluid to said operator housing;
engaging said downstop member against said one or more stem spacers to stop axial movement of said bonnet stem and close said valve;
removing pressurized fluid from said operator housing;
applying force to said bonnet stem with a biasing member to move said bonnet stem axially away from said valve in response to said step of removing pressurized fluid to open said valve; and
removing said operator housing from said bonnet housing without affecting said bonnet stem drift.

17. The method of Claim 17, further comprising:
providing a metallic insert on a diaphragm; and
sealing around said metallic insert with an elastomeric seal member.

18. The method of Claim 17, further comprising:
providing a top shaft extending from said operator housing; and
applying axial force to said top shaft to move said bonnet stem axially while preventing said top shaft from applying torque to said bonnet stem.

19. The method of Claim 18, further comprising:
disposing a shaft seal and an operator housing bore seal on a top shaft sealing cartridge; and
inserting said top shaft sealing cartridge into a operator housing bore in said operator housing without removing said operator housing from said bonnet housing.

20. The method of Claim 17, further comprising:
applying additional force to said bonnet stem with a second operator.